FUSCOE
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PRELIMINARY
HYDROMODIFICATION MANAGEMENT STUDY

RANCHO CIELO PARCEL 'VC'
EA LOG NO. 86-06-026B

APRIL 2013

County of San Diego, CA
TM 5440, S04-043, R05-010, SPA 05-004
LOT 109, TM 4229-4, Map No. 12764

prepared for:

Rancho Cielo Estates
PO Box 2303
Rancho Santa Fe, CA 92067

Fuscoe Engineering, Inc.
6390 Greenwich Drive, Suite 170
San Diego, California 92122
858.554.1500

www.fuscoe.com

Kenneth T. Kozlik, PE
Job # 02711-001-01

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April 15, 2013

Dennis Campbell
Land Use and Environmental Planner
THE COUNTY OF SAN DIEGO
DEPT. OF PLANNING AND LAND USE
5510 Overland Ave., Suite 310
San Diego, CA 92123

Rancho Cielo – SPA 3813 05-004, EA 3910-86-06-026B, TM 3100-5440, TM 3100-5441
Single Family Residential Site Plan

Mr. Campbell,

Enclosed please find the technical studies for TM 5440 and 5441, which have been revised to reflect the change from the single lot condominium site plan with 42 units to a single family residential site plan with 24 single family lots. The following studies are provided for your review:

- SWMP for TM 5440 and 5441 (Updated to August 2012 Major SWMP Template)
- Preliminary Drainage Studies for TM 5440 and 5441
- Preliminary Hydromodification Management Studies for TM 5440 and 5441

The revised studies are in substantial conformance with the studies which have been previously reviewed. In fact, due to the lower density of the proposed single family site plan, hydromodification and peak flow mitigation needs have been reduced and opportunities for LID BMPs have been increased, resulting in higher quality storm water treatment.

Please feel free to contact me with any questions or comments.

Sincerely,
FUSCOE ENGINEERING, INC.

Kenneth T. Kozlik, PE
Project Manager

PRELIMINARY HYDROMODIFICATION MANAGEMENT STUDY

RANCHO CIELO PARCEL 'VC' COUNTY OF SAN DIEGO, CA

REGISTERED PROFESSIONAL ENGINEER
KENNETH T. KOZLIK
C 71883
EXP. 12/31/13
CIVIL
STATE OF CALIFORNIA

Prepared By:

7/24/13

Kenneth T. Kozlik, PE | RCE 71883 | EXP: 12-31-13
Fuscoe Engineering, San Diego, Inc.
6390 Greenwich Dr., Ste 170
San Diego, CA 92122

For

Rancho Cielo Estates
PO Box 2303
Rancho Santa Fe, CA 92067
858-756-5667

April 2013

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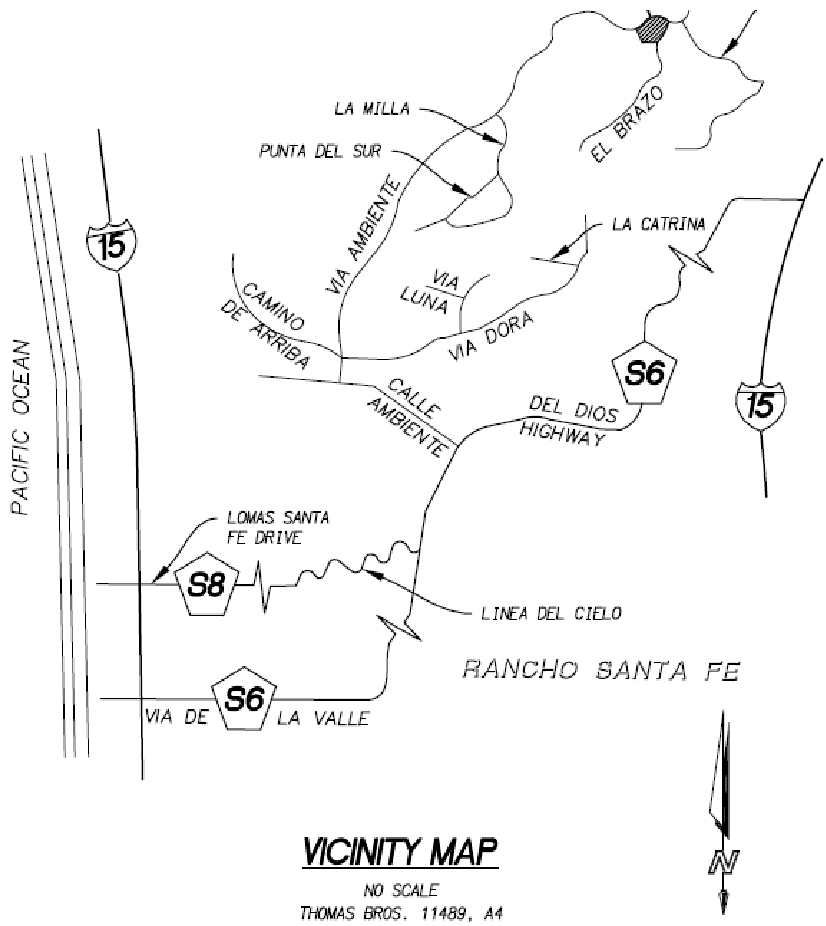


Figure 1 Vicinity Map

1.0 PROJECT DESCRIPTION

This Preliminary Hydromodification Management Study analyzes and proposes mitigation for the hydromodification impacts of the Rancho Cielo Parcel 'VC' project. The proposed development of Rancho Cielo Parcel 'VC' consists of seven single family residential lots. A portion of the project site will be dedicated as an open space easement. The project areas is located along Via Ambiente in the community of Rancho Cielo, to the north of Rancho Santa Fe, CA. Refer to the following Vicinity Map.

The project site is 5.59 acres. The existing site is characterized by a hilltop surrounded by steep slopes. Via Ambiente forms the northerly boundary of the project and El Brazo forms the easterly boundary. Low density residential development exists along a portion of the westerly and southerly project boundary, while the remainder of the adjacent area is undeveloped. The proposed project will construct a driveway on Via Ambiente west of the intersection with El Brazo. The residential lots will be accessed via a private interior cul-de-sac street.

2.0 SITE INFORMATION

The following sections summarize the site conditions which relate to drainage and hydromodification, including the geotechnical conditions, drainage basins, and the low flow threshold determination.

2.1 GEOTECHNICAL CONDITIONS

The site soils are classified as San Miguel-Exchequer rocky silt loams (SnG). These soils belong to Hydrologic Soil Group D, representing low infiltration rates. Shallow bedrock is also present, typically at a depth in the range of 4 to 34 inches. A Custom Soil Resource Report prepared by the Natural Resources Conservation Service is provided in Appendix 1 for reference.

Due to the presence of Group D soils and shallow bedrock, infiltration-based Integrated Management Practices (IMPs) are not feasible for the project site.

2.2 DRAINAGE BASINS

Due to the hilltop nature of the site, runoff from the project site splits into several drainage basins.

Basin 1 encompasses the majority of the southern portions of the site. This basin drains to a canyon onsite which drains to the south, conveying flows to the San Dieguito River.

Basin 2 consists of the easterly slope. Runoff from this basin is collected by an existing brow ditch leading to a Type 'F' inlet. This runoff is collected and piped through the existing 18" RCP storm drain and discharges east of El Brazo, a private street. These existing drainage facilities were constructed per TM 4229-2. The runoff then runs down a canyon east of El Brazo and eventually leads to the San Dieguito River. Refer to the Existing Hydrology Map included in the appendix.

Basin 3 is located along the northerly frontage of the project along Via Ambiente. Consisting of street drainage on Via Ambiente and runoff from the northerly slope, the basin leads to an existing catch basin near the intersection with El Brazo. The catch basin connects to an underground storm drain system which outlets to a canyon to the east of the intersection of Via Ambiente and El Brazo. This canyon flows southwest to a confluence with the San Dieguito River.

2.3 LOW FLOW THRESHOLD DETERMINATION

An assessment of the susceptibility of the receiving channels to erosion was not performed for this project at this time. Therefore, the low flow threshold corresponding to a highly susceptible channel, $0.1Q_2$, was used.

A channel assessment may be preformed during future phases of design. Due to the steep and rocky nature of the surrounding canyons, a future channel assessment may reveal the receiving channels to be of medium or low susceptibility to erosion. If this is the case, future phases of the design may be based on the low flow thresholds which correspond to the assessed susceptibility.

3.0 METHODOLOGY

The hydromodification analysis for Rancho Cielo Parcel 'H' has been done in accordance with the Final Hydromodification Management Plan, dated January 14, 2011.

3.1 DRAINAGE MANAGEMENT STRATEGY

The drainage management strategy for the project utilizes multifunction IMPs to provide water quality treatment and hydromodification mitigation for the developed portions of the site. Points of Compliance (POCs) have been identified where the proposed storm drain system will discharge to the surrounding natural drainage courses or to the existing storm drain system. If the project proposes to increase un-mitigated post-development flows to a POC, an IMP was then designed to mitigate the impacts of the increase. The IMPs then discharge to the natural drainage courses or existing storm drain system. Where an IMP discharges to a natural drainage course, energy dissipation will be provided.

To size the IMPs, the areas tributary to each IMP were delineated into Drainage Management Areas (DMAs). Separate DMAs were created for proposed impervious areas, such as roofs and pavement, and proposed pervious areas, including landscape and slopes. Since building footprints are not available due to the preliminary nature of this study, the impervious area on the building pads is based on the density of the proposed pads. The pads have a minimum size of 10,000 sf, giving a density of 4.3 du/ac. Per Table 3-1 of the Hydrology Manual, residential land uses at a density of 4.3 du/ac contain an average imperviousness of 30%. This imperviousness percentage is applied to the pad areas to determine the amount of impervious area on each lot. Refer to the Hydromodification Management Exhibit in Appendix 4 for the location of each POC, IMP, and DMA.

3.2 BMP SIZING CALCULATOR

The San Diego Hydromodification Sizing Calculator, developed by Brown and Caldwell, was utilized to size the IMPs. As the proposed IMPs are a bioretention basins, the “LID Sizer” feature of the Calculator was used. The IMPs were sized for “Treatment + Flow Control”. The project is located on Type D soils within the Oceanside rainfall basin. The existing site slopes are steep for all the project basins. The output from the Calculator, as well as screen capture images of the input data entered into the Calculator, can be found in Appendix 2.

4.0 CALCULATIONS/RESULTS

4.1 BIORETENTION BASINS

Where possible, storm water treatment and hydromodification mitigation will be accomplished on the residential pads. This is done by draining the pads toward a bioretention basin located in the rear of the pad. This approach is not feasible in DMA 1, where Lot 1 is unable to drain offsite and the private road requires treatment and hydromodification mitigation. Therefore DMA 1 drains to a shared bioretention basin on Lot 7, which will accept flows from Lots 1 and 7, as well as the private street. The following table summarizes the DMAs which drain to each bioretention basin.

DMA #	DMA Type	Area (Ac)	Soil Type	Slope	Pre-Project Cover	Post-Project Cover
1 IMP	Drains to LID	0.46	D	Steep	Pervious	Impervious
1 PER	Drains to LID	0.72	D	Steep	Pervious	Pervious
2 IMP	Drains to LID	0.08	D	Steep	Pervious	Impervious
2 PER	Drains to LID	0.18	D	Steep	Pervious	Pervious
3 IMP	Drains to LID	0.08	D	Steep	Pervious	Impervious
3 PER	Drains to LID	0.18	D	Steep	Pervious	Pervious
4 IMP	Drains to LID	0.07	D	Steep	Pervious	Impervious
4 PER	Drains to LID	0.17	D	Steep	Pervious	Pervious
5 IMP	Drains to LID	0.07	D	Steep	Pervious	Impervious

5 PER	Drains to LID	0.17	D	Steep	Pervious	Pervious
6 IMP	Drains to LID	0.07	D	Steep	Pervious	Impervious
6 PER	Drains to LID	0.16	D	Steep	Pervious	Pervious

An overflow catch basin will be provided at 10" above the surface of the bioretention basins. The bioretention basins will consist of 18" of planting soil with a minimum infiltration rate of 5 in/hr, and 30" of open-graded gravel with a void ratio of 40%. Due to the presence of Type D soils, a subdrain will be required in the bioretention basins to collect runoff which has filtered through the bioretention media. An end cap with drilled orifice will be placed over the end of the subdrain line where it enters the overflow catch basin in order to reduce the flowrate to non-erosive levels. Outflow from the bioretention basins will be conveyed by a storm drain pipe down the rear slope of the lot to either a concrete ditch or the existing ground at the toe of the slope. Where the storm drain discharges at the toe of the slope, energy dissipation will be provided. The properties of each of the bioretention IMPs are summarized in the table below.

IMP #	Low Flow Threshold (cfs)	Area (sf)		V1 (cf)		V2 (cf)		Orifice Dia. (in)
		Min.	Provided	Min.	Provided	Min.	Provided	
1	0.028	1506	1520	1256	1262	903	912	0.9
2	0.006	277	280	231	232	166	168	0.4
3	0.006	277	278	231	231	166	167	0.4
4	0.005	246	258	205	214	147	155	0.4
5	0.005	246	258	205	214	147	155	0.4
6	0.005	243	244	203	203	146	146	0.4

Since the bioretention basins were sized for treatment and flow control, the basins will also function as treatment control IMPs. See the project's Storm Water Management Plan for further information. Refer to Appendix 2 for output from the Calculator, and to the Hydromodification Management Exhibit in Appendix 4 for a typical cross section of the bioretention basins.

4.2 POC 3

No hydromodification mitigation is required for POC 3. This is due to the reduction in areas draining to this POC, and the minor amounts of development proposed within the tributary area. POC 3 is located at the downstream terminus of its drainage basin. No impervious surfaces are proposed in Basin 3, and the area of this Basin will be reduced, leading to a reduction in discharge to POC 3. Although the areas within the drainage basins will change due to the proposed development, diversion between basins has been kept below 1 acre. The table below lists the existing and proposed areas, runoff coefficients, and 100-year discharges from these basins.

Basin	Existing			Proposed		
	Runoff Coefficient	Area (Ac)	Q100 (cfs)	Runoff Coefficient	Area (Ac)	Q100 (cfs)
3	0.52	1.0	4.4	0.59	0.9	4.3

5.0 MAINTENANCE

Maintenance of the proposed IMPs will be performed by the Rancho Cielo Parcel 'VC' homeowner's association. Until the formation of the homeowner's association, Rancho Cielo Estates or the current owner of the property will be responsible for maintenance. Maintenance of the IMP will include landscape maintenance of the vegetation within the basins, and ensuring that the orifices, overflow inlets, and storm drain pipes remain clear of obstructions.

6.0 SUMMARY AND CONCLUSIONS

The hydromodification mitigation measures proposed for the Rancho Cielo Parcel 'VC' project will satisfy the requirements of the Final Hydromodification Management Plan. In portions of the project where discharges will increase, this will be achieved through the use of bioretention IMPs which will reduce runoff flows and durations from the developed areas of the project to below pre-project levels for the flow range of $0.1Q_2$ to Q_{10}. The IMPs have been designed using the San Diego Hydromodification Sizing Calculator. Proper energy dissipation will also be provided where necessary. Maintenance of the IMPs will be performed by the Rancho Cielo Parcel 'VC' homeowner's association. Please refer to the Storm Water Management Plan and Preliminary Drainage Study for further information regarding the water quality aspects of the proposed IMPs and the project drainage.

7.0 APPENDICES

Appendix 1	*Custom Soils Resource Report*
Appendix 2	*BMP Sizing Calculator Output*
Appendix 3	*Existing Hydrology Exhibit*
Appendix 4	*Hydromodification Management Exhibit*

Appendix 1

Custom Soil Resource Report

United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

San Diego County Area, California

Rancho Cielo Parcels H and VC

February 25, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,550 if printed on A size (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:2,550 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

San Diego County Area, California (CA638)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
SnG	San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes	20.4	100.0%
Totals for Area of Interest		**20.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Diego County Area, California

SnG—San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes

Map Unit Setting

Elevation: 400 to 3,300 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 220 to 280 days

Map Unit Composition

San miguel and similar soils: 45 percent
Exchequer and similar soils: 35 percent
Minor components: 20 percent

Description of San Miguel

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Residuum weathered from metavolcanics

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 to 34 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 15.0
Available water capacity: Low (about 3.5 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: ACID CLAYPAN (R019XD062CA)

Typical profile

0 to 8 inches: Silt loam
8 to 18 inches: Clay loam, silty clay loam, clay
18 to 23 inches: Gravelly clay loam, gravelly silty clay loam, gravelly clay
23 to 27 inches: Unweathered bedrock

Description of Exchequer

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Concave

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: 4 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: SHALLOW LOAMY (R019XD060CA)

Typical profile

0 to 10 inches: Gravelly silt loam
10 to 14 inches: Unweathered bedrock

Minor Components

Rock outcrop

Percent of map unit: 10 percent

Escondido

Percent of map unit: 5 percent

Friant

Percent of map unit: 5 percent

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

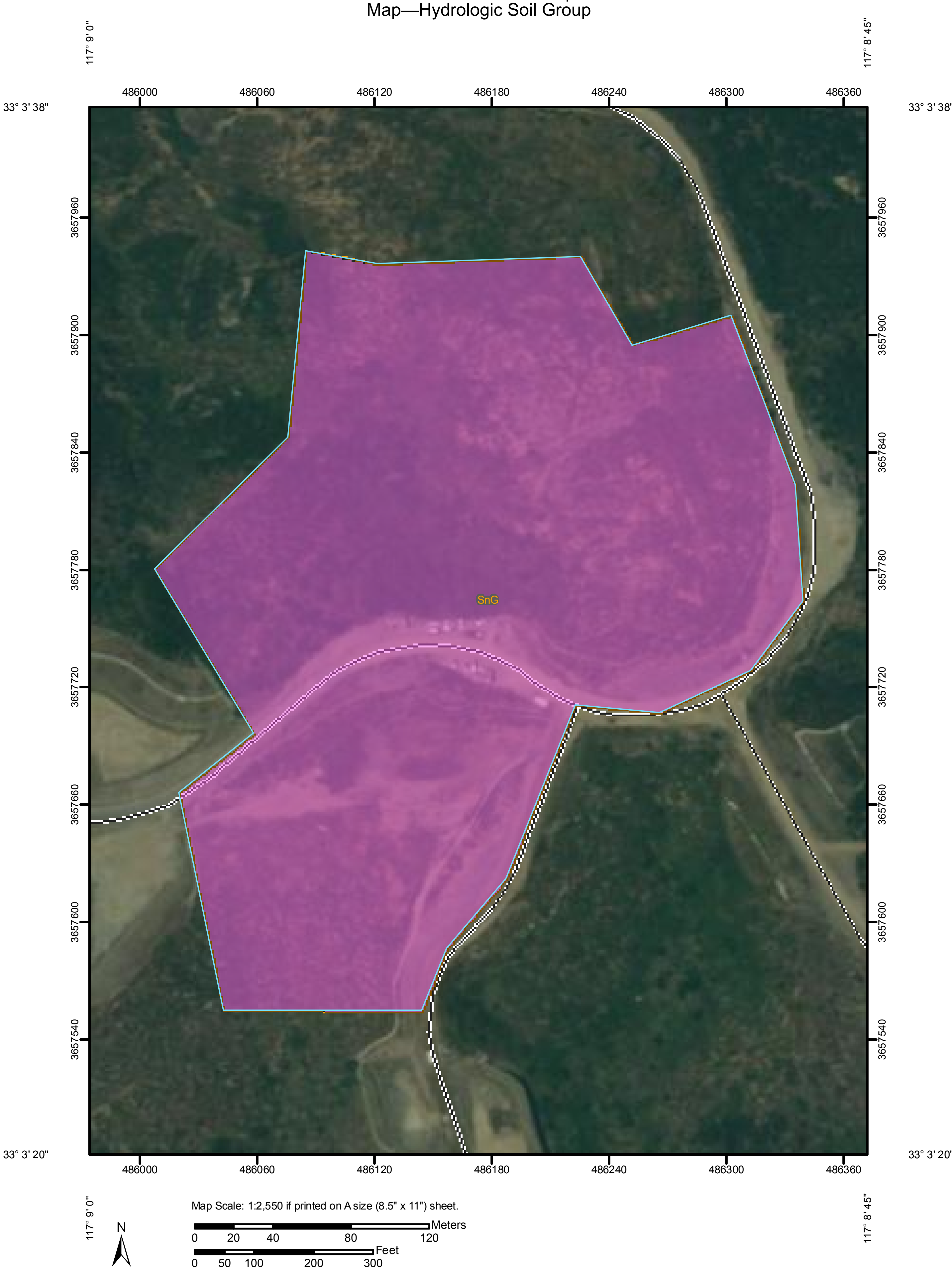
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Oceans

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:2,550 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
SnG	San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes	D	20.4	100.0%
Totals for Area of Interest			**20.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

References

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Appendix 2

BMP Sizing Calculator Output

Project Name: Rancho Cielo Estates - Parcel 'VC'
Project Location: Via Ambiente / El Brazo
APN: 264-382-16
Total Projet Area: 243,500 sf
Mean Annual Precipitation at Project Site: 16.5 in

SELF TREATING AREA

DMA	Area
ST1	88,100 sf
ST2	19,600 sf
ST3	24,500 sf

IMPs - Bioretention Basins

Soil Type	IMP Name
D	IMP 1

DMA	DMA Area	Post-Project Surface Type
1 IMP	0.46 ac	Impervious
1 PER	0.72 ac	Pervious

	Minimum	Proposed
Plan Area	1,506 sf	1,520 sf
V1	1,256 cf	1,262 cf
V2	903 cf	912 cf

Soil Type	IMP Name
D	IMP 2

DMA	DMA Area	Post-Project Surface Type
2 IMP	0.08 ac	Impervious
2 PER	0.18 ac	Pervious

	Minimum	Proposed
Plan Area	277 sf	280 sf
V1	231 cf	232 cf
V2	166 cf	168 cf

Soil Type	IMP Name
D	IMP 3

DMA	DMA Area	Post-Project Surface Type
3 IMP	0.08 ac	Impervious
3 PER	0.18 ac	Pervious

	Minimum	Proposed
Plan Area	277 sf	278 sf
V1	231 cf	231 cf
V2	166 cf	167 cf

Soil Type	IMP Name
D	IMP 4

DMA	DMA Area	Post-Project Surface Type
4 IMP	0.07 ac	Impervious
4 PER	0.17 ac	Pervious

	Minimum	Proposed
Plan Area	246 sf	258 sf
V1	205 cf	214 cf
V2	147 cf	155 cf

Soil Type	IMP Name
D	IMP 5

DMA	DMA Area	Post-Project Surface Type
5 IMP	0.07 ac	Impervious
5 PER	0.17 ac	Pervious

	Minimum	Proposed
Plan Area	246 sf	258 sf
V1	205 cf	214 cf
V2	147 cf	155 cf

Soil Type	IMP Name
D	IMP 6

DMA	DMA Area	Post-Project Surface Type
6 IMP	0.07 ac	Impervious
6 PER	0.16 ac	Pervious

	Minimum	Proposed
Plan Area	243 sf	244 sf
V1	203 cf	203 cf
V2	146 cf	146 cf

Project Summary

Project Name	Cielo - Parcel VC
Project Applicant	
Jurisdiction	County of San Diego
Parcel (APN)	
Hydrologic Unit	San Dieguito

Compliance Basin Summary

Basin Name:	Parcel VC
Receiving Water:	Discharge Point
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	3.21
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

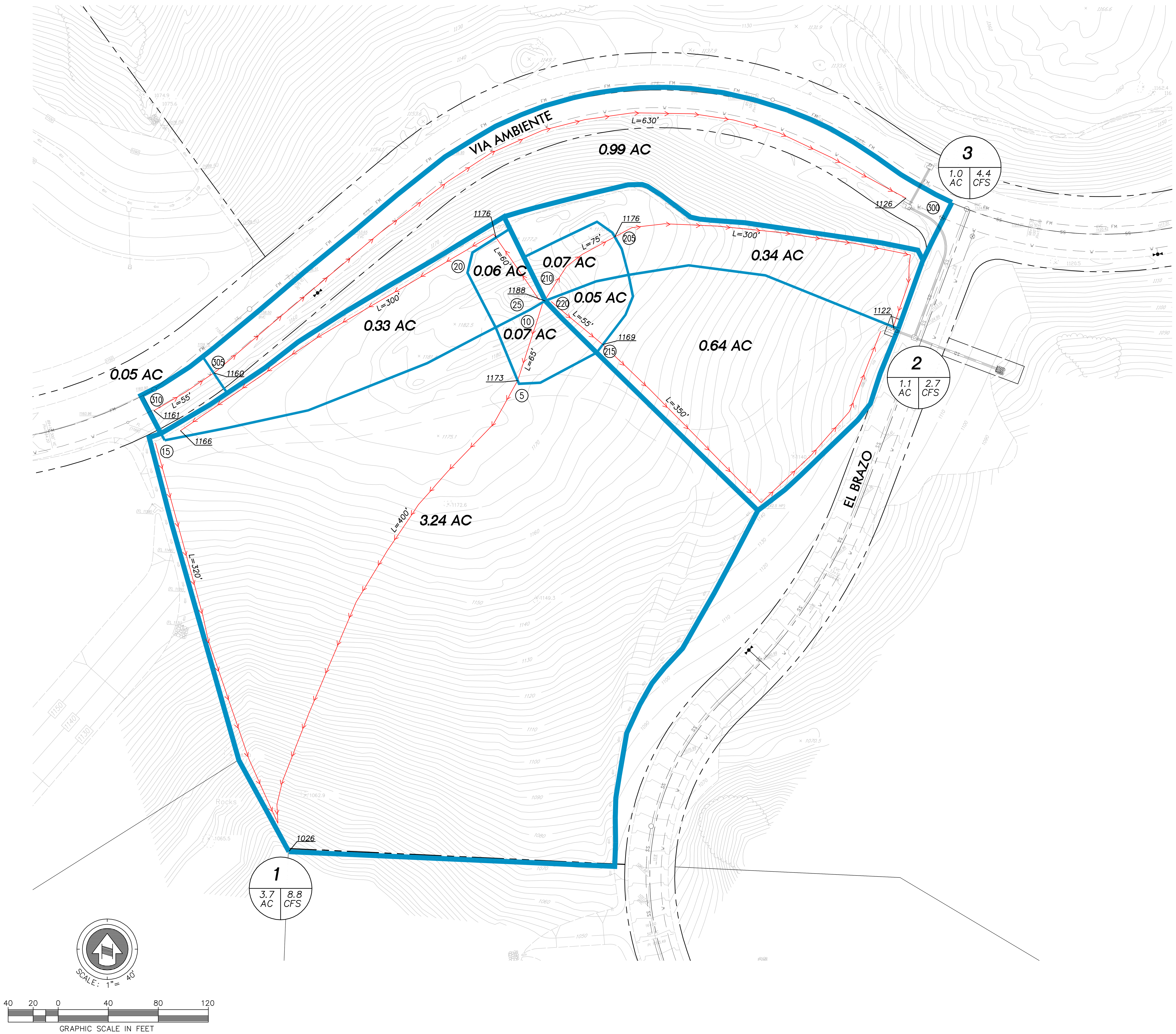
ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
25703	Drains to LID	BMP 1	DMA 1 IMP	0.46	Pervious (Pre)	Concrete or asphalt	Type D (high runoff - clay soi...	Steep (greater 10%)
25704	Drains to LID	BMP 1	DMA 1 PER	0.72	Pervious (Pre)	Landscaping	Type D (high runoff - clay soi...	Steep (greater 10%)
25705	Drains to LID	BMP 2	DMA 2 IMP	0.08	Pervious (Pre)	Concrete or asphalt	Type D (high runoff - clay soi...	Steep (greater 10%)
25706	Drains to LID	BMP 2	DMA 2 PER	0.18	Pervious (Pre)	Landscaping	Type D (high runoff - clay soi...	Steep (greater 10%)
25707	Drains to LID	BMP 3	DMA 3 IMP	0.08	Pervious (Pre)	Concrete or asphalt	Type D (high runoff - clay soi...	Steep (greater 10%)
25708	Drains to LID	BMP 3	DMA 3 PER	0.18	Pervious (Pre)	Landscaping	Type D (high runoff - clay soi...	Steep (greater 10%)

25709	Drains to LID	BMP 4	DMA 4 IMP	0.07	Pervious (Pre)	Concrete or asphalt	Type D (high runoff - clay soi...	Steep (greater 10%)
25710	Drains to LID	BMP 4	DMA 4 PER	0.17	Pervious (Pre)	Landscaping	Type D (high runoff - clay soi...	Steep (greater 10%)
25711	Drains to LID	BMP 5	DMA 5 IMP	0.07	Pervious (Pre)	Concrete or asphalt	Type D (high runoff - clay soi...	Steep (greater 10%)
25712	Drains to LID	BMP 5	DMA 5 PER	0.17	Pervious (Pre)	Landscaping	Type D (high runoff - clay soi...	Steep (greater 10%)
25713	Drains to LID	BMP 6	DMA 6 IMP	0.07	Pervious (Pre)	Concrete or asphalt	Type D (high runoff - clay soi...	Steep (greater 10%)
25714	Drains to LID	BMP 6	DMA 6 PER	0.16	Pervious (Pre)	Landscaping	Type D (high runoff - clay soi...	Steep (greater 10%)

LID Facility Summary

BMP ID	Type	Description	Plan Area (sqft)	Volume 1(cft)	Volume 2(cft)	Orifice Flow (cfs)	Orifice Size (inch)
BMP 1	Bioretention	IMP 1	1506	1256	903	0.028	0.9
BMP 2	Bioretention	IMP 2	277	231	166	0.006	0.4
BMP 3	Bioretention	IMP 3	277	231	166	0.006	0.4
BMP 4	Bioretention	IMP 4	246	205	147	0.005	0.4
BMP 5	Bioretention	IMP 5	246	205	147	0.005	0.4
BMP 6	Bioretention	IMP 6	243	203	146	0.005	0.4

Appendix 3
Existing Hydrology Exhibit



LEGEND

PROPERTY LINE	
EXISTING LOT LINE	
RIGHT-OF-WAY	
EXISTING CONTOUR	
EXISTING STORM DRAIN	
BASIN BOUNDARY	
FLOW PATH	
HYDROLOGY NODE	XX
POINT OF ANALYSIS	X / X AC / X CFS

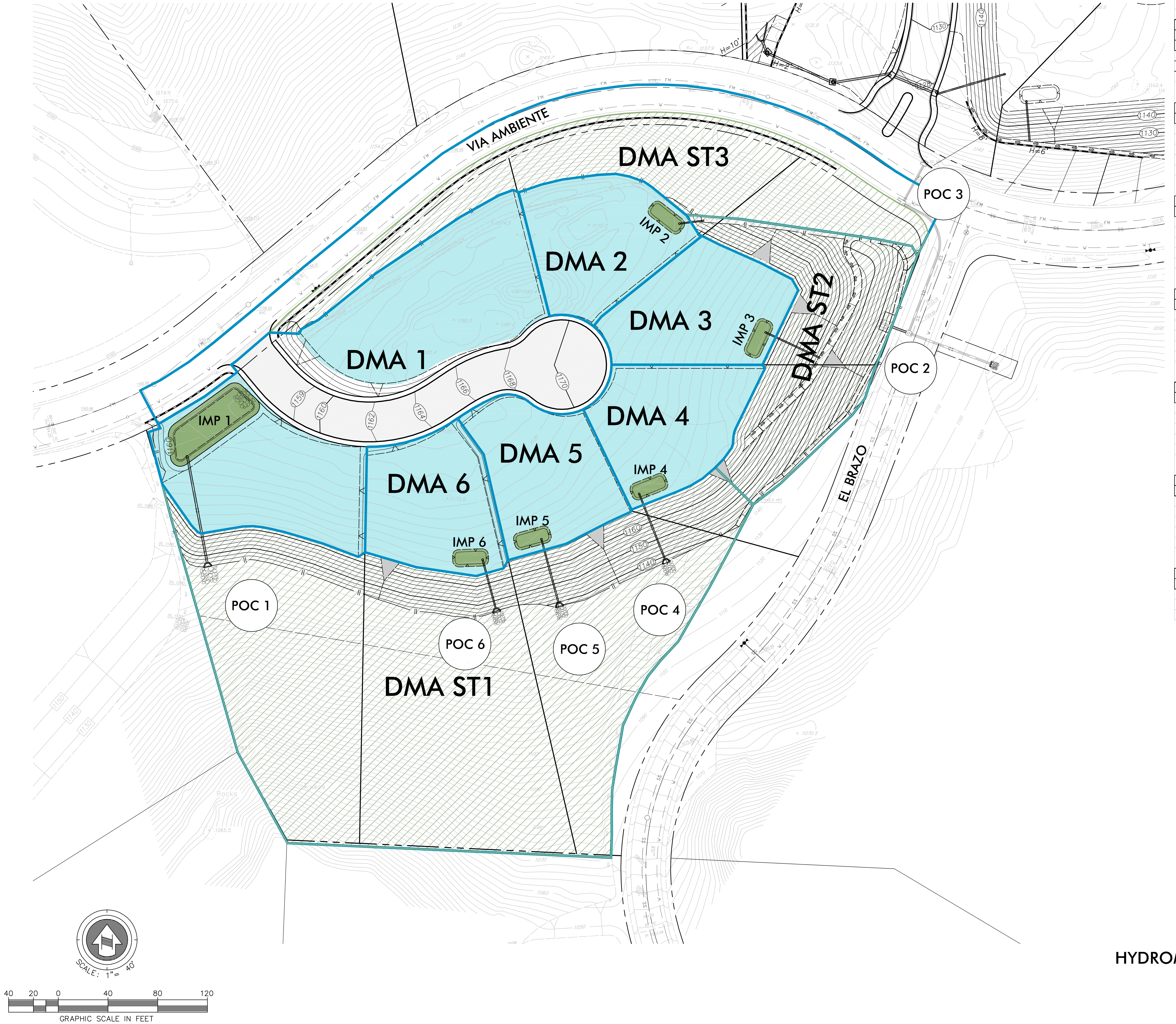
RANCHO CIELO PARCEL 'VC'
EXISTING 100-YEAR HYDROLOGY
COUNTY OF SAN DIEGO, CA

PROJECT NUMBER: 02711-001-01
DATE: 4/15/13

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

Appendix 4

Hydromodification Management Exhibit



SELF TREATING AREA

DMA	Area
ST1	88,100 sf
ST2	19,600 sf
ST3	24,500 sf

IMPs - Bioretention Basins

DMA	DMA Area	Post-Project Surface Type	Soil Type	IMP Name
1 IMP	0.46 ac	Impervious	D	IMP 1
1 PER	0.72 ac	Pervious		

	Minimum	Proposed
Plan Area	1,506 sf	1,520 sf
V1	1,256 cf	1,262 cf
V2	903 cf	912 cf

DMA	DMA Area	Post-Project Surface Type	Soil Type	IMP Name
2 IMP	0.08 ac	Impervious	D	IMP 2
2 PER	0.18 ac	Pervious		

	Minimum	Proposed
Plan Area	277 sf	280 sf
V1	231 cf	232 cf
V2	166 cf	168 cf

DMA	DMA Area	Post-Project Surface Type	Soil Type	IMP Name
3 IMP	0.08 ac	Impervious	D	IMP 3
3 PER	0.18 ac	Pervious		

	Minimum	Proposed
Plan Area	277 sf	278 sf
V1	231 cf	231 cf
V2	166 cf	167 cf

DMA	DMA Area	Post-Project Surface Type	Soil Type	IMP Name
4 IMP	0.07 ac	Impervious	D	IMP 4
4 PER	0.17 ac	Pervious		

	Minimum	Proposed
Plan Area	246 sf	258 sf
V1	205 cf	214 cf
V2	147 cf	155 cf

DMA	DMA Area	Post-Project Surface Type	Soil Type	IMP Name
5 IMP	0.07 ac	Impervious	D	IMP 5
5 PER	0.17 ac	Pervious		

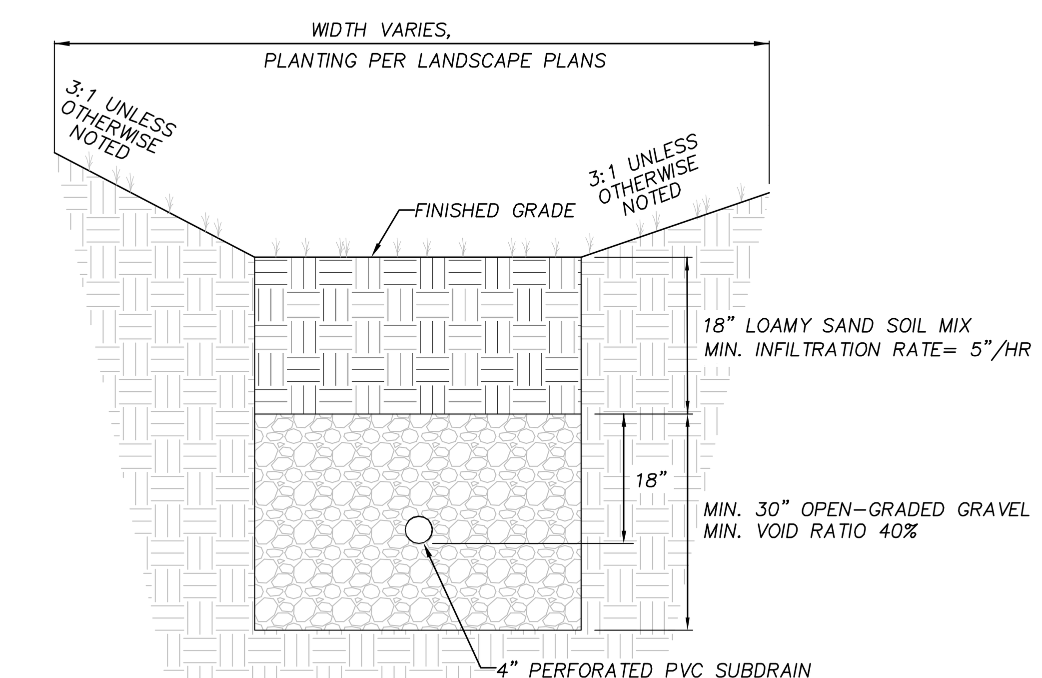
	Minimum	Proposed
Plan Area	246 sf	258 sf
V1	205 cf	214 cf
V2	147 cf	155 cf

DMA	DMA Area	Post-Project Surface Type	Soil Type	IMP Name
6 IMP	0.07 ac	Impervious	D	IMP 6
6 PER	0.16 ac	Pervious		

	Minimum	Proposed
Plan Area	243 sf	244 sf
V1	203 cf	203 cf
V2	146 cf	146 cf

LEGEND

- PROPERTY LINE
- EXISTING LOT LINE
- RIGHT-OF-WAY
- EXISTING CONTOUR
- EXISTING STORM DRAIN
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN
- PROPOSED PAVEMENT
- PROPOSED BUILDING PADS (30% IMPERVIOUS)
- BASIN BOUNDARY
- POINT OF COMPLIANCE — POC #
- INTEGRATED MANAGEMENT PRACTICE — IMP #



TYPICAL DETAIL - BIORETENTION BASIN

NOT TO SCALE

RANCHO CIELO PARCEL 'VC'
HYDROMODIFICATION MANAGEMENT EXHIBIT
COUNTY OF SAN DIEGO, CA

PROJECT NUMBER: 02711-001-01
DATE: 4/15/2013

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San Diego, California 92122
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www.fuscoe.com